

**TAXONOMY AND HOST RELATIONS OF THE TRIBE ORMIINI  
IN THE WESTERN HEMISPHERE**

(DIPTERA, LARVAEVIDAE)

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The yellow to testaceous flies of the larvaevorid (tachinid) tribe Ormiini (*sensu* Townsend) are relatively uncommon in collections, and little has been known of their host relations. Their remarkable uniformity in habitus and characteristics has made them difficult to determine, and available names have often been misapplied. An important rearing by W. L. Nutting of a species in this group prompted an examination by the writer of available material and evidence. Even though it is still not possible to be conclusive in some respects, it is desirable, as a guide for future work, to bring together and evaluate the scattered records as far as possible, and to present a review of the present knowledge of the tribe as it occurs in the Western Hemisphere.

Approximately 260 specimens have been studied, including the holotypes of twelve species and one subspecies. Information on several other types has been furnished by J. E. Collin of Newmarket, England, F. van Emden of London, M. Beier of Vienna, and E. Séguéy of Paris. C. H. Curran of the American Museum of Natural History [AMNH] arranged for the loan of two holotypes and other material, and M. Beier and H. Mayer of Vienna for the loan of the type of *Tachina depleta* Wiedemann. I am deeply indebted to these correspondents for their generous assistance in the fundamental matter of types, and to J. Bequaert of the Museum of Comparative Zoology [MCZ], R. H. Beamer of the University of Kansas [KU], and particularly to H. J. Reinhard of Texas A. & M. College for the loan of specimens. The bulk of the available material is in the collection of the U. S. National Museum [USNM]. The most commonly cited collections have been abbreviated as noted above, in brackets.

Not all of the characters given prominence by Townsend in his key to genera (1936, *Manual of Myiology* 3:101) have proved reliable. Although Townsend defined *Ormia* Robineau-Desvoidy and *Euphasiopteryx* Townsend as having black epaulets, several species with yellow epaulets are now known. Further, he distinguished *Ormia* by the combination of ocelli present and male with callosities on both costa and second vein, but two new species described below have ocelli but the males lack the second callosity. One might conclude that there is only one genus, *Ormia*, with synonym *Euphasiopteryx*.

However, in my opinion the presence or absence of ocelli is a significant character, for these are almost universally present in muscoid flies. I here propose to recognize two genera—*Ormia*, with ocelli present, and *Euphasiopteryx*, with ocelli absent.

In view of the above remarks, the status of *Ormiophasia* Tns. may also be questioned. Although it is somewhat larger and darker than *Ormia*, I can find no fundamental differences. However, not having males before me, and recognizing a slightly different habitus that may have some significance even though not of great magnitude, I leave it as distinct for the present. It is included in the key to *Ormia*, having ocelli present.

Determining whether ocelli are present or absent offers little difficulty in the females, which have the front broad and the ocellar triangle moderately large; in those males (e.g., *Ormia punctata*) with a relatively broad front this also is not difficult. In males with the front narrow and the ocellar area reduced, however, there may be difficulty. In these, if ocelli are present (*Ormia*), the ocellar area is distinctly raised above the eye level as an ocellar tubercle. If ocelli are absent (*Euphasiopteryx*), the front is depressed at the vertex, there is no raised tubercle, and the small ocellar area is below the eye level and shows only as a low, indistinctly bounded area bearing a few pairs of bristles or hairs.

A certain amount of difference between species exists in the structure of the filter apparatus over the posterior thoracic spiracle. This character was utilized by Curran (1934, Bull. Amer. Mus. Nat. Hist. 66:495-496) in describing *Ormia guianica* and *O. dominicana* (see under *Euphasiopteryx*), and it can be useful if one does not attempt to differentiate too finely, or to use it on specimens not in good condition. It must also be cautioned that there is a great difference between the sexes in this character. In all males of the Ormiini, the posterior valve or flap is normally broad, with a long feathery fringe, completely covering the opening up to the anterior marginal fringe, which is also long in the males. In the females, the posterior valve may be similar to that of the male, or of moderate width, or quite slender and by no means completely covering the opening.

#### HOST RELATIONS

In 1911 (Annals Ent. Soc. Amer. 4:136-137), Townsend reported on dissections of three females (as *Phasiopteryx*) from Colorado, Vera Cruz, and Peru. From these specimens still preserved in the U. S. National Museum, the three are now known to be, respectively, *Euphasiopteryx ochracea* (Bigot)

(as *P. montana* Tns., holotype), *Ormia bilimekii* (B. & B.), and *E. australis* (Tns.) (holotype). He found first-stage maggots present, indicating the habit of larviposition. He had no idea of the hosts, though on a later page (p. 150), he speculated that the "*Phasiapteryx*-type of maggot" with smooth segmental plates would be well adapted to seek out and attack such hosts as crambid larvae working underground in silk-lined galleries. The following year (1912, Jour. New York Ent. Soc. 20:114-117), Townsend described these remarkable larvae in some detail for the first two of the above mentioned species.

Later in 1912, when Townsend published the description of the adult *E. australis* (1912, Proc. U. S. Nat. Mus. 43:352-353, as *Phasiapteryx*), he suggested that *australis* might be parasitic in larvae of a small coprophagous scarab, allied to *Onthophagus*, which was common at Piura, Peru, the type locality of *australis*. He was apparently led to suggest this partly because a related genus *Trixa* had been reared from coprophagous scarabs, and partly because the structure of the first-stage maggot was adapted both for enduring long exposure, such as might result if maggots were deposited at the edge of fresh dung and left to await the arrival of scarabs, and for attachment to chitinized surfaces, because the larvae might have to attach to the beetles until the dung pellet was formed, and thence transfer to the pellet. In 1913 (Canad. Ent. 45:54-55), in discussing the relationships of muscoid flies, Townsend reasoned from the type of larva that "the maggots [are] deposited where they must seek the host for themselves." By 1915 (Proc. Ent. Soc. Wash. 17:53), he was speculating that the highly specialized planidium type of maggot indicated "most likely a parasitism on ant or wasp pupae."

Greene (1922, Proc. U. S. Nat. Mus. 60, Art. 10:5) figured and described the puparium of *Euphasiapteryx ochracea* (Bigot) (as *Oestrophasia*). No data were published at the time, but the puparia of that series were found by F. C. Bishopp "under decaying cabbage on city dump, Dallas, Texas, Sept. 28, 1914," as noted by Townsend (1936, Manual of Myiology 3:102), and adults emerged Oct. 10, 1914. The host was unknown.

Subsequently, Reinhard (1922, Ent. News 33:72) published a record of "*Ormia ochracea* Bigot" as a parasite of *Gryllus assimilis*, based on three maggots which issued from an adult cricket on Sept. 22, 1920, and pupated the same day. No flies emerged, but the puparia were identified by C. T. Greene from comparison with those of the flies reared by Dr. Bishopp. In view of the other closely related species now known to

occur in Texas, but as yet unknown from puparia, this record cannot be accepted positively for *ochracea*, but the peculiarity of the puparium, and the later developments reviewed below, are assurance that the record is undoubtedly that of an ormiine fly, and it may well be that of *ochracea*.

It is interesting to note that although this is the first published record of a host, *Euphasiopteryx ochracea* had already been reared from "crickets" at Chickasha, Okla., Sept. 1, 1914, by E. G. Kelly (Experiment K 508). Three adults (2 males, 1 female) of this material are now in the U. S. National Museum, probably from the W. R. Walton Collection.

Townsend (1936, Manual 3:99-102) described the female reproductive system in detail and speculated on the host relations of the tribe. The only host record known to him was the cricket recorded by Reinhard (1922) based on the fly puparia, but he doubted that this was a normal host. He noted that the only known rearing of adult ormiines was that of *ochracea* by Bishopp (cf. Greene, 1922, above), but those puparia might have come from any of a variety of hosts. He concluded that the armored planidia-like maggots are so well adapted for entering nests of social Hymenoptera that "their natural hosts would seem unmistakably to be ants, bees, or wasps." By the end of his Manual, however, Townsend was aware of the record by Wolcott (1940, q.v.), for he recorded it in the host catalogue (1942, Manual 12:239).

Wolcott (1940, Journ. Econ. Ent. 33:202) recorded "*Euphasiopteryx australis* (Tns.)" [in this case, actually *E. depleta* (Wied.), q.v.] as a parasite in Brazil of the changa or mole cricket, *Scapteriscus vicinus* Scudder. He also stated that E. G. Smyth had written him of rearing it or a related species from a green katydid, *Neoconocephalus* sp., at Trujillo, Peru. On two different occasions, "*E. australis*" was introduced into Puerto Rico, but not in large numbers and without being successfully established, according to Wolcott (1951, Jour. Agr. Univ. Puerto Rico 32(3):476). He noted that parasitism of the changa in the Amazon region varied from one to five percent. The fly was found to be decidedly nocturnal, hiding by day but active at night, a habit which would correlate well with the habits of cricket and katydid hosts.

Nutting (in press) reared several specimens of a new subspecies of *Euphasiopteryx brevicornis* from *Neoconocephalus robustus* (Scudder) in Massachusetts, and is reporting on his observations and on the immature stages. This latest find, coupled with the slowly accumulated evidence reviewed above, suggests that contrary to past speculation, the ormiine flies are probably normal parasites of certain adult Orthoptera, especially those with nocturnal habits such as the crickets and katydids.

IMMATURE STAGES

*Larvae*.—Descriptions or figures, or both, have been published by Townsend for the first-stage maggots of *Ormia bilimekii*, *Ormiophasia busckii*, *Euphasiopteryx australis*, *E. ochracea* (as *E. montana*), *E. brevicornis*, and *E. dominicana* (all but *bilimekii* were dissected from holotype). Some striking differences are evident, and it will be interesting to investigate the larvae for all species in the group.

*Puparia* of three species of *Euphasiopteryx*, *E. ochracea*, *E. depleta* from Brazil, and *E. brevicornis nuttingi*, are available and they are easily distinguished at a glance. The puparium of *ochracea*, described and figured by Greene (1922), has long spiracular protuberances parallel to the longitudinal axis of the puparium. In *depleta*, however, the equally long protuberances are directed posterodorsad at 45° angle to the longitudinal axis. In *b. nuttingi*, the angle is not as great and the protuberances are much shorter and somewhat closer together. Nutting (in press) has given detailed figures of the three puparia. No puparia of *Ormia* or *Ormiophasia* are known to me.

KEY TO GENERA OF ORMIINI OF WESTERN HEMISPHERE

- Ocelli present; female with two or three proclinate orbital bristles  
 ..... *Ormia* R. D.  
 (including *Ormiophasia* Tns.)
- Ocelli absent; female generally with a row of 4 to 7 proclinate orbitals  
 ..... *Euphasiopteryx* Tns.

Genus *Ormia* Robineau-Desvoidy

- 1830 *Ormia* Robineau-Desvoidy, Essai sur les Myodaires, p. 428. Type, *O. punctata* R. D., by monotypy.
- 1835 *Ochromyia* Macquart, Hist. nat. Insectes, Diptères, 2:250. [*Ormia* in synonymy.]
- 1878 *Ormia*; Osten Saeken, Catalogue Diptera N. Amer., p. 163 [*Ochromyia* Macq. in synonymy.]
- 1889 *Phasiopteryx* Brauer and Bergenstamm, Zweifl. Kais. Mus. Wein, pt. 4:78-79 (1890, Denksehr. Akad. Wiss. Wien, Math.-Nat. Classe, 56(1):146-147). [Two species, *P. Bilimekii* n. sp. and *Tachina depleta* Wied., the first apparently intended as genotype.]
- 1890 *Neoptera* Van der Wulp, Biologia Centrali-Amer., Dipt. 2:165. Type, *N. rufa* Wulp, by monotypy.
- 1893 *Phasiopteryx*; Brauer and Bergenstamm, Zweifl. Kais. Mus. Wein, pt. 6:71 (1893, Denksehr., etc. 60:159. [Generic description; *P. Bilimecki* (sic!) mentioned, and this has been accepted by Townsend (1938) as type designation.]
- 1895 *Ormia*; Brauer, Sitzber. Kais. Akad. Wiss. Wien 104: 597. [*Phasiopteryx* in synonymy.]

- 1897 *Oestrophasia* B. & B.; Coquillett, U. S. Dept. Agriculture, Div. Ent., Tech. Ser., Bull. 7:70 (Revision of Tachinidae). [*Phasiapteryx*, *Neoptera*, etc., in synonymy.]
- 1910 *Ormia*; Coquillette, Proc. U. S. Nat. Mus. 37:580. [Synonyms are *Neoptera*, p. 575, and *Phasiapteryx*, p. 588, the latter with designation of *P. bilimekii* as type.]
- 1919 *Ormia*; Townsend, Ins. Insc. Menstr. 6:182. [*Phasiapteryx* in synonymy.]
- 1919 *Ormia*; Sureouf, Nouv. Archives Mus. d'Hist. Nat. Paris, ser. 5, 6:115. [Brief descr.; type unknown to him, and genus not recognized.]
- 1922 *Ormia*; Aldrich, Proc. U. S. Nat. Mus. 62(Art. 11):5 [Synonyms are *Phasiapteryx*, *Neoptera*, *Euphasiapteryx*, *Ormiophasia*.]
- 1925 *Ormia*; Séguy, Bull. Mus. d'Hist. Nat. Paris, 31:440. [Key to five species of *punctata* group, some now in *Euphasiapteryx*.]
- 1926 *Ormia*; Séguy, Encycl. Ent., Ser. B, II, Dipt., 3:9. [In key to "Oestridae dubiosae."]
- 1927 [1926?] *Ormia*; Townsend, Revista Mus. Paulista 15:223. [In generic key.]
- 1927 *Ormia*; Séguy, C. R. Congrès Soc. Savantes, Paris 1926, p. 424. [In key to four genera of Ormiina, recognizing *Plagiotormia*, *Pseudoneoptera*, and *Pseudormia* as distinct.]
- 1929 *Ormia*; Malloch, Ann. & Mag. Nat. Hist., ser. 10, 3:279. [Doubts propriety of separating *Euphasiapteryx* and *Ormiophasia* from *Ormia*.]
- 1932 *Ormia*; Malloch, Ann. & Mag. Nat. Hist., ser 10, 10:312. [Notes on generic characters.]
- 1934 *Ormia*; Curran, Bull. Amer. Mus. Nat. Hist. 66:495. [Key to 7 spp.]
- 1936 *Ormia*; Townsend, Manual of Myiology 3:101. [In key to genera of tribe Ormiini.]
- 1936 *Ormia*; Townsend, *ibid.* 4:278,280. [*Neoptera* and *Phasiapteryx* listed as synonyms of *Ormia*.]
- 1938 *Ormia*; Townsend, *ibid.* 7:234-235. [Detailed generic description, descr. of first stage larvae, synonymy of *Neoptera* and *Phasiapteryx*.]

There may be a number of undescribed species of *Ormia* (*s. str.*) in the Neotropical Region. Nine females before me may belong to as many as five different species, depending upon what is ultimately learned of variation in certain characters. Four specimens (Costa Rica, Panama, Venezuela) of possibly two species pass to *lineifrons* in the following key, whereas the other five (Guatemala, Panama, Ecuador, West Indies) of two or three species pass to couplet 7. In all cases, the lack of males and of good series make it impossible to do more with them. It is undesirable to add to the difficulties in this group by naming these weakly differentiated females.

*Ormia serrei* Séguéy, described from a female from Costa Rica, also passes as far as couplet 6 in the key, but it must be classed with the other females impossible to recognize at this stage of our knowledge.

KEY TO ORMIA AND ORMIOPHASIA <sup>1</sup>

1. One strong pair of presutural acrostichal bristles midway of prescutum, and sometimes a weaker anterior pair; front narrow, barely half the width of an eye in females; mesonotum and scutellum usually blackish, and abdomen predominantly brown to black, basally yellow, sometimes body all testaceous  
 ..... *Ormiophasia* (6. *O. busckii* Tns.)  
 (7. *O. moradi* Séguéy)
- Two or three pairs of presutural acrostichals, including one pair adjacent to mesonotal suture; front generally broader in females; body entirely yellow to testaceous (*Ormia*)..... 2
2. Epaulet yellow, concolorous with subepaulet; one stigmal bristle; male with weak costal callosity between apices of first and second veins, but none on second vein 1. *Ormia wolcotti*, new species  
 Epaulet black; two strong stigmal bristles (occasionally one lacking on one side)..... 3
3. Males (costal callosity present)..... 4  
 Females (no costal callosity)..... 6
4. Wing with two strong callosities, one on costa beyond end of first vein, the other behind it on second vein; front broad for males, obviously wider than distance across posterior ocelli, and one tenth or more times the width of head ..... 5  
 Wing with small but distinct callosity on costa beyond end of first vein, but none on second; front narrow, at most frontalia linear and total width of front less than .05 times the head width, or less than distance across posterior ocelli .....  
 ..... 2. *Ormia lineifrons*, new species
5. Front broad, at vertex .16 to .21 times the width of head; Florida, West Indies ..... 3. *Ormia punctata* R. D.  
 Front narrower, at vertex .11 to .125 times width of head; Texas, Mexico..... 4. *Ormia bilimekii* (B. & B.)
6. First vein joining costa distinctly beyond level of small crossvein, by at least length of latter; wing relatively long and not broadly rounded apically, the distance from small crossvein to apex of wing 1.2 times that from crossvein to epaulet.....  
 ..... 2. *Ormia lineifrons*, new species  
 First vein joining costa opposite or basad the level of small crossvein; wing shorter and more bluntly rounded apically.

<sup>1</sup> 5. *Ormia serrei* Séguéy not included.

- the distance from small crossvein to apex of wing equal to or shorter than from crossvein to epaulet..... 7
- 7.2 West Indies and Florida; apical cell closed at margin, or very narrowly open.....3. *Ormia punctata* R. D.
- Mexico and Texas; apical cell broadly open, the third and fourth veins separated by a distance approaching length of small crossvein.....4. *Ormia bilimekii* (B. & B.)

### 1. *Ormia wolcotti*, new species

- 1924 *Ormia punctata* R. D.; Wolcott, Jour. Dept. Agr. Puerto Rico 7(1):225, in part. [Puerto Rico: Pt. Cangrejos specimen here; the Aibonito specimen unknown to me.]
- 1931 *Ormia dominicana* Tns., Curran, Amer. Mus. Novitates 456:23. [Female, Coamo Springs, Puerto Rico, now in AMNH].
- 1936 *Ormia dominicana* Tns.; Wolcott, Jour. Agr. Univ. Puerto Rico 20(1):359 ("Insectae Borinquenses.") [Cites records of Wolcott, 1924 and Curran, 1931.]
- 1951 *Ormia punctata* R. D.; Wolcott, Jour. Agr. Univ. Puerto Rico 32(3):480 ("The Insects of Puerto Rico.") [Repeats records of Wolcott, 1936.]

Epaulet yellow, one stigmal bristle, and male with weak callosity on costa, none on second vein.

*Male*.—Entirely yellow to testaceous except for conspicuous black spot at small crossvein and black bristles. Front at narrowest point about equal to breadth of third antennal segment and as wide or slightly wider than distance across posterior ocelli, the width in the four males .05, .06, .06, and .08 (holotype) times the width of the head; parafacials bare; third antennal segment twice the length of second; arista pubescent. Mesonotum with two pairs of presutural dorsocentral bristles and one or two pairs of presutural acrostichals, the pair adjacent to suture sometimes weak; mesonotal hairs brown to blackish, the pleural hairs yellow; one strong propleural bristle, usually with short black accessory bristle immediately below, and one stigmal, surrounded by a number of yellow hairs. Abdomen without median marginal bristles on second and third segments (apparent first and second), and no discals on the third and fourth; hairs black. Wing not distorted as in *O. punctata*, the submarginal cell with longitudinal fold but not unusually broadened; first vein short, ending in costa opposite the small crossvein; costa with small callosity midway between apices of first and second veins, scarcely evident in side view but discernible at anterior edge of wing as a distinct though slight widening of the space between the two rows of black costal setulae.

<sup>2</sup> I have not found a satisfactory way of separating females of *punctata* and *bilimekii*, except by geography and association with males. The above couplet applies to the nine specimens before me, including three *punctata* and six *bilimekii*, but evidence from other species suggests that the character is not to be trusted.

*Female*.—Color, general structure, and chaetotaxy as in male. Front of moderate width, at vertex .27, .28 and .30 (allotype) times the width of head, the sides diverging so that across the lunule the width is .39 (allotype) and .41 times the width of head; parafrontals not broad, each subequal to or less than width of frontalia; two pairs of strong proclinate orbital bristles; parafacials bare. Posterior thoracic spiracle with posterior valve of filter apparatus well-developed, fairly broad, with dense fringe. Wing without costal callosity, but otherwise as in male.

Length, 5 to 7 mm.

*Types*.—Holotype male, Guánica, Puerto Rico, Aug. 18, 1913 (E. G. Smyth). Type No. 61734 in the U. S. National Museum. Allotype, Pt. Cangrejos, P. R., May 10, 1920 (G. N. Wolcott). Paratypes: 1 ♂, Constitution Hill, Christiansted, St. Croix, Virgin Islands, April 1936 (H. A. Beatty); 1 ♀, St. Croix, V. I. (Beatty); 1 ♂, Santiago, Cuba, March 1906 (J. M. Espin) [USNM]; 1 ♂, Mayaguez, P. R., Dec. 2, 1930 (L. Martorell); 1 ♀, Coamo Springs, P. R., April 10, 1930 (W. T. M. Forbes) [AMNH].

Variation in wing as follows: Apical cell open in five specimens, closed at margin in one female, short petiolate in one male; angle of fourth vein generally rounded, one female with trace of appendage.

I take pleasure in naming this species for Dr. G. N. Wolcott, who has devoted many years to the insect fauna of Puerto Rico.

## 2. *Ormia lineifrons*, new species

1949 *Ormia* n. sp.; Fattig, Emory University Mus. Bull. 8:24 (Dallas, Ga.).

Black epaulet, two strong stigmatal bristles, and male with linear front and callosity on costa but not on second vein.

*Male*.—Yellow to testaceous except for black epaulet and bristles and brown to blackish spot at small crossvein. Front extremely narrow, approximately half the distance across posterior ocelli, the linear parafrontals touching except in Georgia paratype, the frontal width only .02 to .03 times the head width in four of the specimens, slightly wider in Georgia paratype (.046); parafacials bare; third antennal segment approximately twice length of second; arista microscopically pubescent. Mesonotal chaetotaxy somewhat variable, with 2 to 3 pairs each of pre-sutural dorsocentrals and acrostichals; mesonotal hairs numerous, fine, long, and erect, brown to blackish; pleural hairs yellow to brown; one strong propleural bristle and short accessory bristle immediately below it; two strong stigmatal bristles, the upper slightly shorter and weaker, with a number of long yellow hairs surrounding them. Abdomen as described for *wolcotti*. Wing with normal shape, not distorted as in *punctata*, though submarginal cell with strong longitudinal fold; first

vein longer than in *wolcotti* and *punctata*, ending in costa beyond level of small crossvein by at least the length of latter; wing slightly elongate, the distance from small crossvein to apex of wing greater than from crossvein to epaulet (1.10 to 1.17 times); costal callosity of moderate size, slightly larger than in *wolcotti*, evident in side view, and anteriorly well marked as a broadly fusiform, flattened area by the abrupt divergence of the two rows of black costal setulae.

*Female*.—Color, general structure and chaetotaxy as in male. Front of moderate width, at the vertex .255 times, and across the lunule .40 times the width of head; parafrenal barely wider than frontalia; three pairs of strong proclinate orbitals; parafrenals bare. Posterior valve of filter apparatus on hind thoracic spiracle not broadened, lanceolate, with moderate fringe. Wing without costal callosity, slightly elongate as in male, the distance between small crossvein and apex of wing 1.2 times that from crossvein to epaulet.

Length, 7.5 to 8 mm.

*Types*.—Holotype male, Bosch Finca, Cayey, Puerto Rico, Dec. 27, 1932 (R. G. Oakley). Type No. 61735 in the U. S. National Museum. Allotype, "Florida" (Mrs. Slosson [AMNH]). Paratypes: 1 ♂, "West Indies"; 1 ♂, Dallas, Ga., Oct. 22, 1941 (P. W. Fattig) [USNM]; 1 ♂, Dayton, Fla., April 8, 1919 (C. W. Johnson) [MCZ]; 1 ♂, San José del Cabo, Baja California, Mexico (W. M. Wheeler Colln.) [AMNH.]

Variation in wing as follows: Apical cell widely open in four males, in one male and the female closed at margin in one wing but open in other; angle of fourth vein rounded in one male, with short appendage in four males, and with long appendage in the female.

The paratype from Baja California is far distant from the others, but I can find no differences. This species may be an uncommon Neotropical form, and further collecting will connect up the extremes.

### 3. *Ormia punctata* Robineau-Desvoidy (s. str.)

- 1830 *Ormia punctata* Robineau-Desvoidy, Essai sur les Myodaires, p. 428. ["Antilles"; male, judging from descr.]
- 1835 *Ochromyia punctata* (R. D.) Macquart, Hist. nat. Insectes, Diptères 2:250. [Generic reference.]
- 1878 *Ormia punctata* (R. D.) Osten Sacken, Catalogue Dipt. N. Amer., 2nd edition, p. 163. [Listed.]
- 1887 *Ormia punctata* (R. D.) Gundlach, Anales Soc. Española Hist. Nat. 16:193 ("Fauna Puerto-Riqueña," pt. 6, p. 403) [In Muscidae; type said to come from Jamaica.]
- 1895 *Clytiomyia punctata* Coquillett, Jour. New York Ent. Soc. 3:52. [Florida, female, in USNM; locality not stated, but listed by Coq. (1897) as Charlotte Harbor, Fla. Synonym and homonym.]
- 1895 *Clytiomyia punctata* Coq.: Johnson, Proc. Acad. Nat. Sci. Phila., 1895, p. 333. [Charlotte Harbor, Fla.]

- 1897 *Estrophasia punctata* (Coq.) Coquillett, U. S. Dept. Agriculture, Div. Ent., Tech. Ser. Bull. 7:71. [In key, distinguished from "*Phasiopteryx bilimekii* BB.," but Coquillett's example of latter was later described by Townsend as *Ormia brevicornis*.]
- 1905 *Estrophasia punctata* (Coq.) Aldrich, Catalogue N. Amer. Diptera, p. 440. [Listed; *Ormia punctata* R. D. not mentioned.]
- 1913 *Estrophasia punctata* (Coq.) Johnson, Bull. Amer. Mus. Nat. Hist. 32:71. [Biscayne Bay specimen in AMNH; Jacksonville spm. not found.]
- 1915 *Ormia punctata* R. D.; Townsend, Ent. News 26:366 [*Clytiomyia punctata* Coq. a synonym.]
- 1922 *Ormia punctata* R. D.; Aldrich, Proc. U. S. Nat. Mus. 62(Art. 11):5. [Fla. records refer to *punctata*, Mexican to *bilimekii*, as here recognized; *punctata* Coq. in synonymy.]
- 1936 *Ormia punctata* R. D.; Townsend, Manual of Myiology 3:101. [With *punctata* Coq. as synonym; distinct from *O. bilimekii* BB.]
- 1938 *Ormia punctata* R. D.; Townsend, Manual of Myiology 7:234. [Distinct from *O. bilimekii*.]

The type of *Ormia punctata* is not in the Robineau-Desvoidy collection in the Muséum d'Histoire naturelle at Paris, according to information received from M. Séguy, and apparently must be considered lost. This is most unfortunate, for the species is the oldest in the genus, it is the genotype of *Ormia*, by monotypy, and the name has been widely used, though obviously with various applications.

The original description does not mention the color of the epaulet, nor whether ocelli are present or absent, but taxonomists have generally used the name for a Neotropical species (or two as recognized here) with ocelli and black epaulet in which the male has the characteristically dilated costa and greatly broadened submarginal cell mentioned in the original description. Records based on males are undoubtedly either *punctata* or the related *bilimekii*, but those based on females are suspect until re-examined.

Townsend (1931, Revista Ent. 1:82) saw the type of *Phasiopteryx bilimekii* and identified it as a synonym of *Ormia punctata* R. D., as Aldrich had already done in 1924 (Annals Ent. Soc. Amer. 17:215). However, a few years later (1936), Townsend regarded *punctata* and *bilimekii* as distinct species. I agree with this, for I find that the Antillean and Floridian form is distinct from the Mexican. Inasmuch as the type of *punctata* came from the "Antilles," the name *punctata* must be restricted to the form occurring in that area.

The salient features of *punctata* are contained in the key. The distorted wing of the male, with greatly broadened submarginal cell and strong callosities on both costa and second vein, distinguishes that sex from all other known species in both *Ormia* and *Euphasiopteryx*, save *O. bilimekii*, which appears from available material to have a consistently narrower front than *punctata*. In eight available males of *punctata*,

the ratios of width of front at vertex to width of head average .17 (range .16 to .21), whereas the ratios in nine males of *bilimekii* average only .12 (range .11 to .125).

In the female sex, the length and shape of wing, and the length of first vein, will separate *punctata* and *bilimekii* from *lineifrons*, but the first two are difficult to separate from each other. The character of the apical cell, used in couplet 7, is not dependable elsewhere in this group, and one should not place much reliance on it here. Geographic location, or association with characteristic males, will indicate the probable identity.

In both species, the propleural bristle is regularly accompanied by a black accessory bristle immediately below it, and both propleural and stigmal bristles are surrounded by a number of pale yellow hairs. There are no median marginal bristles on the second and third (apparent first and second) abdominal segments, and no discals on the third and fourth. The veins are yellow, with black spot at the small crossvein. The angle of the fourth vein is generally rounded in the males, with an appendage in an occasional specimen, one of the latter having a short stub in the left wing and an appendage extending to the margin in the right wing. In the females the vein generally has a short stub at the angle. The posterior thoracic spiracle is small for this group, and in the females the posterior valve of the filter apparatus is relatively broad and with long fringe, nearly covering the opening.

*Distribution*.—Florida and West Indies, as far as known. I have seen seven males, three females as follows: FLORIDA: 1 ♂, "Fla."; 2 ♂, "Fla." (C. V. Riley), determined as *bilimekii* by Brauer and Bergenstamm; 1 ♂, Miami, Oct. 23 (C. H. T. Townsend); 1 ♀, St. Augustine, Nov. 8, 1911 [USNM]; 1 ♀, Biscayne Bay (Mrs. Slosson) [AMNH]. CUBA: 1 ♂, Santiago de las Vegas, Habana, Dec. 14, 1925 [AMNH]; 1 ♀, Isla de Pinos, 1923 (C. H. Ballou) [USNM]. HAITI: 1 ♂ Carrefour, Jan. 7, 1922 [USNM]. PUERTO RICO: 1 ♂, Jayuya, Dec. 1935 (A. Suarez) [AMNH].

*Unverified Records:*

- 1895 *Phasipteryx bilimekii* B. & B.; Johnson, Proc. Acad. Nat. Sci. Phila., 1895, p. 333. [Georgiana, Fla.]
- 1913 *Æstrophasia bilimekii* (B. & B.) Johnson, Bull. Amer. Mus. Nat. Hist. 32:71. [Georgiana, Fla. record repeated.]
- 1919 *Æstrophasia punctata* (Coq.) Johnson, Bull. Amer. Mus. Nat. Hist. 41:436. [Linguanea Plain, Jamaica.]
- 1925 *Ormia punctata* R. D.: Séguy, Bull. Mus. d'Hist. Nat. Paris 31(6):440. [In key to females of five species, no spms. recorded; the key characters fit no *punctata* or *bilimekii* that I have seen, but possibly variations.]

- 1926 *Aestrophasia* [*sic!*] *punctata* (Coq.) Gowdey, Dept. Agric. Jamaica, Ent. Bull. 4:81. [Jamaica; *Ormia punctata* R. D. cited in synonymy.]
- 1927 *Ormia punctata* R. D.: Séguy, C. R. Congrès Soc. Savantes, Paris 1926, p. 424. [Costa Rica.]
- 1931 *Ormia punctata* R. D.: Engel, Konowia 10:138. [Male, N. Chiquitos, Bolivia.]
- 1934 *Ormia punctata* R. D.: Curran, Bull. Amer. Mus. Nat. Hist. 66:495. [In key; 3 females, Kartabo, British Guiana, but from the characters given in the key, these were not *punctata*.]

#### 4. *Ormia bilimekii* (Brauer and Bergenstamm)

- 1889 *Phasiopteryx Bilimekii* Brauer and Bergenstamm, Zweifl. Kais. Mus. Wien 4:78-79. (1890, Denkschr. Akad. Wiss. Wien, Math. Nat. Classe 56(1):146-147). [Orizaba, Mexico; male, female, in Vienna Museum.]
- 1890 *Neoptera rufa* Van der Wulp, Biologia Centrali-Amer., Dipt. 2:166, and Plate 4, figs. 11-12. [Mexico: male, Vera Cruz, and female, Tabasco, in British Museum (Nat. Hist.).]
- 1891 *Phasiopteryx bilimeki* B. & B.; Van der Wulp, Biologia Centrali-Amer., Dipt. 2:211. [*Neoptera rufa* a synonym; a female eotype of *Pyrrosia ochracea* Bigot, loaned him by Bigot, is also the same.]
- 1891 *Phasiopteryx Bilimekii* B. & B.; Brauer and Bergenstamm, Zweifl. Kais. Mus. Wien 5:84, 108, 120, 134 (1891, Denkschr. etc., 58:388, 412, 424, 438). [In key with *P. depleta* (Wied.); *Neoptera rufa* listed as syn., also *Pyrrosia ochracea* Bigot teste Van der Wulp.]
- 1893 *Phasiopteryx Bilimecki* [*sic!*] B. & B.; Brauer and Bergenstamm, Zweifl. Kais. Mus. Wien 6:71 (Denkschr., etc. 60:159). [Description.]
- 1893 *Phasiopteryx ochracea* (Big.); Giglio-Tos, Mem. Reale Accad. Sei. Torino, Ser. 2, 44:522. [Synonyms: *P. Bilimekii* B. B., *N. rufa* Wulp, latter on authority of Van der Wulp.]
- 1894 *Phasiopteryx Bilimeki* B. & B.; Brauer and Bergenstamm, Zweifl., etc. 7:82 (1895, Denkschr., etc. 61:618). [Additional description.]
- 1895 *Ormia punctata* R. D.; Brauer, Sitzber. Kais. Akad. Wiss. Wien 104:597. [Synonym: *N. rufa* Wulp.]
- 1897 *Phasiopteryx Bilimeki* B. & B.; Townsend, Ann. & Mag. Nat. Hist., ser. 6, 19:33. [Notes on male, San Rafael, Vera Cruz, now in USNM.]
- 1905 *Aestrophasia bilimekii* (B. & B.) Aldrich, Catalogue N. Amer. Diptera, p. 439. [Listed.]
- 1908 *Phasiopteryx bilimeki* B. & B.; Townsend, Smithson. Miscell. Colln. 51:60. [Notes that several forms probably confused.]
- 1911 *Phasiopteryx* sp., probably *P. bilimeki*; Townsend, Annals Ent. Soc. Amer. 4:136-137. [Female, Orizaba, Vera Cruz, now in

- USNM; description of first-stage maggot and internal characters of female.]
- 1912 *Phasiapteryx bilimeki* B. & B.; Townsend, Jour. New York Ent. Soc. 20:116. [Detailed description of first-stage maggot.]
- 1912 *Phasiapteryx bilimeki* B. & B.; Townsend, Proc. U.S. Nat. Mus. 43:353. [Reference to larval characters.]
- 1922 *Ormia punctata* R. D.; Aldrich, Proc. U. S. Nat. Mus. 62(Art. 11):5. [Descriptive notes; Synonyms: *P. bilimeki*, *N. rufa* Wulp, *Clytiomyia punctata* Coq.; Florida and Mexico, the spms. of former now referred to *punctata* s. str.]
- 1924 *Ormia punctata* R. D.; Aldrich, Annals Ent. Soc. Amer. 17:215. [Synonymy from male, female types of *bilimekii* loaned by Vienna Mus.]
- 1931 *Ormia punctata* R. D.; Townsend, Revista Ent. 1:82. [Synonymy from type of *bilimeki* in Vienna Mus.]
- 1936 *Ormia bilimekii* (B. & B.) Townsend, Manual of Myiology 3:101. [Synonym, *N. rufa* Wulp; distinct from *O. punctata* R. D.]
- 1938 *Ormia bilimekii* (B. & B.) Townsend, Manual of Myiology 7:234. [As in Townsend (1936).]
- 1942 *Ormia bilimekii* (B. & B.) Townsend, Manual of Myiology 12:324, plate 27, fig. 222, and plate 28, figs. 223, 224. [First-stage maggot, described by Townsend, 1911 and 1912.]

The principal characters of this species are contained in the key, and further discussion is given above under *O. punctata*, with which *bilimekii* has often been confused.

From notes kindly furnished by J. E. Collin, it is clear that the two females of the type series of *Pyrrhosia ochracea* Bigot, described from Mexico, are *Ormia bilimekii*, whereas the male of *ochracea* (herein designated as lectotype) is a species of *Euphasiopteryx*. Mr. Collin and Dr. van Emden compared the females directly with the type of *Neoptera rufa* Wulp in the British Museum, and concluded that they are conspecific. This was the conclusion of Van der Wulp (1891), and his advice resulted in the synonymy published by Gigliot-Tos (1893).

*Distribution*.—Southern Texas and Mexico, as far as known. I have seen the following: TEXAS: 3 ♂, 3 ♀, Donna, Hidalgo County, Oct. 1933 (J. W. Monk); 1 ♂, Donna, Dec. 19, 1933 (Monk); 1 ♀, Brownsville, Sept. 4, 1937 (C. S. Rude) [Reinhard Colln.]; 1 ♂, Laguna Madre, 25 miles SE. Harlingen, Feb. 17, 1945 (D. E. Hardy); 1 ♂, Lagford, Willacy Co., Dec. 1934 [USNM]. MEXICO: 1 ♂, Frontera, Tabasco, April 22 (C. H. T. Townsend); 1 ♂, San Rafael, V. C., March 9 (Townsend); 1 ♂, Sta. Engracia, Tam. (C. C. Plummer); 1 ♀, Dona Maria, Chiapas (Crawford); 1 ♀, Orizaba, V. C., Jan. 9-16, 1892 (H. Osborn) [USNM].

*Unverified Records:*

- 1895 *Phasipteryx bilimeki* B. & B.; Townsend, Proc. Calif. Acad. Sci., ser. 2, 4:619 [Baja California, Mexico, 2 females, doubtfully identified; spms. not now in Townsend material in USNM or KU, probably destroyed with early collections of Calif. Acad. Sci. It is possible that they were females of the species herein described as *O. lineifrons*, of which a male is known from San José del Cabo.]

5. *Ormia serrei* Séguéy

- 1925 *Ormia Serrei* Séguéy, Bull. Mus. d'Hist. Nat. Paris 31:440. [In key to five species; no further description, no locality.]
- 1926 *Ormia Serrei*: Séguéy, Bull. Soc. Ent. France, 1926, p. 62. [Costa Rica; female, in Paris Mus.]
- 1927 *Ormia Serrei*: Séguéy, C. R. Congrès Soc. Savantes, Paris 1926, p. 424. [Mention.]
- 1927 *Ormia Serrei*: Séguéy, Eneycl. Ent., Ser. B II, Dipt. 4:16. [In key to three species.]

This species, based on a female, cannot be recognized with certainty at this time. One must await much more material and associated sexes in order to clarify its status. It passes at least as far as couplet 6 in the key, and it seems likely to be nearest *O. bilimekii*. However, with scattered tropical material indicating that there may be a number of unrecognized species, it would be unwise even to suggest that synonymy.

Genus *Ormiophasia* Townsend

- 1919 *Ormiophasia* Townsend, Ins. Insc. Menstr. 6:164. Type, *O. busckii* Tns., by original designation and monotypy.
- 1922 *Ormia* R.-D.; Aldrich, Proc. U. S. Nat. Mus. 62(Art. 11):5. [*Ormiophasia* in syn.]
- 1926 *Pseudormia* (p. 5 and Index, p. 203), *Pendormia* (p. 9, in key) Séguéy, Eneycl. Ent., Ser. B, II, Dipt. 3:5,9,203. [Genus validated in generic key; the combination *Pseudormia inflata* mentioned on p. 5, but species not described.]
- 1926 *Pseudormia* Séguéy, loc. cit., p. 20. [In key to three genera; no species cited.]
- 1926 *Pseudoncoptera* Séguéy, loc. cit., p. 19. Type, *P. Morardi* Séguéy by monotypy.
- 1926 *Plagiatormia* (pp. 19, 20), *Plagiatormia* (pp. 19, 203 in Index) Séguéy, loc. cit., pp. 19, 20, 203. [Published as "*Plagiatormia obscura* n. sp." with no indication that the genus was new. In key to three genera, p. 20. Townsend (1936 and 1938) adopted the first spelling.]
- 1927 [1926?] *Ormiophasia*; Townsend, Revista Mus Paulista 15:223. [In key.]

- 1927 *Pseudormia* Séguy, Ann. Soc. Ent. France 96:262. One species. Type, by designation and virtual monotypy, *P. inflata* Séguy.
- 1927 *Plagiatormia* (p. 424; *Plagiatormia* p. 423), *Pseudoneoptera*, and *Pseudormia*; Séguy, C.-R. Congrès Soc. Savantes, Paris 1926, p. 423-424. [All recognized.]
- 1929 *Ormia* R. D.; Malloch, Ann. & Mag. Nat. Hist., ser. 10, 3:279. [Doubts that *Ormiphasia* (sic!) is distinct.]
- 1931 *Ormiophasia* Tns.; Townsend, Revista Ent. 1:82. [Genotypes of Séguy's three genera (see above) are synonyms of *O. busckii*, the genotype of *Ormiophasia*.]
- 1936 *Ormiophasia* Tns.; Townsend, Manual of Myiology 3:101. [In key to genera of *Ormiini*: the three genera of Séguy (see above) are synonyms of it.]
- 1938 *Ormiophasia* Tns.; Townsend, Manual of Myiology 7:236. [Generic description; synonymy as stated in Townsend (1936), but *Plagiatormia* and *Pseudormia* are incorrectly credited to Séguy (1931), the reference given being that of Townsend's paper on the types.]

I have nothing to add to this genus and it is included here only for completeness. Whether Townsend's synonymy of the three Séguy genera is justified or not cannot be verified at the moment. I can only comment that the characters of open or closed apical cell, and rounded or petiolate angle of the fourth vein, do not seem to me to be reliable, judging from the small series before me. Thus I have for the present accepted the synonymy as given by Townsend. One may also question whether *Ormiophasia* deserves separate recognition from *Ormia*, but I have left them distinct for the present.

#### 6. *Ormiophasia busckii* Townsend

- 1919 *Ormiophasia busckii* Townsend, Ins Inse. Menstr. 6:165. [Panama, female, in USNM; genotype by original designation.]
- 1926 *Pseudormia inflata* Séguy, Eneyel. Ent., Ser. B, II, Dipt. 3:5. [Mentioned; validated essentially as "n.g., n.sp.", but not formally described; Séguy, 1927, C. R. Congrès Soc. Savantes, Paris 1926, p. 424 (French Guiana); Séguy, 1927, Ann. Soc. Ent. France 96:262 (French Guiana; female, in Paris Museum.)]
- 1926 *Plagiatormia obscura* Séguy, loc. cit., p. 19. [Argentina; male, in Paris Mus.]
- 1927 *Plagiatormia obscura* Séguy, C. R. Congrès Soc. Savantes, Paris 1926, p. 424.
- 1929 *Ormia* (by implication) *buscki* (Tns.) Malloch, Ann. Mag. Nat. Hist., ser. 10, 3:279. [Costa Rica; doubts that *Ormiophasia* is distinct from *Ormia*.]
- 1931 *Ormiophasia busckii* Tns.; Townsend, Revista Ent. 1:82 [Synonyms: *Pseudormia inflata* Séguy and *Plagiatormia obscura* Séguy; variety is *Pseudoneoptera morardi* Séguy. From types in Paris Museum.]

- 1934 *Ormia buseki* (Tns.) Curran, Bull. Amer. Mus. Nat. Hist. 66:495. [In key; British Guiana.]
- 1936 *Ormiophasia busekii* Tns.; Townsend, Manual of Myiology 3:101. [Synonymy as in Townsend (1931), except *morardi* given merely as "congeneric."']
- 1938 *Ormiophasia busekii* Tns.; Townsend, Manual of Myiology 7:236. [Synonymy as in Townsend (1936).]
- 1942 *Ormiophasia busekii* Tns.; Townsend, Manual of Myiology 12:325, and Plate 28, fig. 226. [Large figure of larva.]  
I know the species from Panama, the Canal Zone, Costa Rica, and Venezuela.

#### 7. *Ormiophasia morardi* (Séguy)

- 1926 *Pseudoneoptera Morardi* Séguy, Eneyel. Ent., Ser. B, II, Dipt. 3:19. [French Guiana; female, in Paris Museum.]
- 1927 *P. Morardi*; Séguy, C. R. Congrès Soc. Savantes, Paris 1926, p. 424. [Mention.]
- 1931 *Ormiophasia busekii* var. *morardi* (Séguy) Townsend, Revista Ent. 1:82. [Combination by implication; "scarcely more than a variety."']
- 1936 *Ormiophasia morardi* (Séguy) Townsend, Manual of Myiology 3:101. [Congeneric with *busekii*.]
- 1938 *Ormiophasia morardi* (Séguy) Townsend, Manual of Myiology 7:236. [Congeneric with *busekii*.]

Note: The treatment of the genus *Euphasiopteryx* Townsend will appear in the December *Proceedings*.—Editor.

### A NEW SPECIES OF CULEX AND NOTES ON OTHER SPECIES OF MOSQUITOES FROM OKINAWA

(DIPTERA, CULICIDAE)

BY RICHARD M. BOHART, *University of California, Davis*

Since publication of a treatise on the mosquitoes of Okinawa (Bohart and Ingram, 1946b) another visit to this Ryukyuan island was made in September 1951, under the auspices of the Department of the Army in collaboration with the Pacific Science Board of the National Research Council. Although time on Okinawa was limited to a few weeks, two trips were made to the northeast part of the island and some interesting material was collected.

The locality visited is a small stream near the ocean in a steep ravine near East Taira. The streambed and parts of the banks are mostly rock with numerous crevices above and below the water level of the stream. The collecting site was brought to my attention by Col. W. J. La Casse who spent several days surveying the northern part of the island in September 1951.